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TUBERCULOSIS IN THE MINES OF BUTTE.

Dr. T. C. Witherspoon.

(Read before the Montana Public Health Association, May 11, 1909.)

When I returned to Butte two years and a little more ago, after an absence of thirteen years, the class of patients to whom my attention was especially directed consisted of that large number of sufferers from pulmonary trouble who are found in our city. Dr. Kistler, my associate, and I began to make special inquiry concerning the nature of so prevalent a trouble, and found to our surprise that a tubercular basis existed in nearly all cases. The number of these pulmonary cases was necessarily large as they go from doctor to doctor seeking aid. We, being new comers and known to a number of residents of Butte, were naturally sought out and came into contact with so many that we were afforded excellent opportunity for serial examinations.

In this paper I will not attempt to give an accurate account of our work, but will present the subject, "Tuberculosis in the Mines of Butte," in a somewhat general manner.

It is well to state that in making our diagnosis, these cases were not only subjected to physical examination, but their sputum to microscopic examination, and a tuberculin reaction test was often called to our aid. The Calmett, Wolf-Eisner conjunctival test; the Von Perquet vaccination test, and Koch's hypodermic test, were the modes of using the tuberculin. I will not enter into a description of the manner in which these tests were given, they being well known, but will only say that we proceeded *secundum artem* in each instance. The tuberculin for the vaccination and hypodermic test was the old tuberculin as obtained from the firm of Victor Koechel. We were guided somewhat by the clearness of the conjunctiva, height of temperature, and the age of the individual, in selecting the tuberculin test to be used.

In passing, let me state that while none of these tests with tuberculin can be relied upon as absolutely conclusive of the presence of an active tubercle lesion in the lung, yet their wide acceptance goes a long way toward confirming an opinion. It will be remembered that Virchow made axiomatic the expression, "Yeder mann hat ein wenig tubercle." This would imply

that in the middle aged adult, each one will have had a tubercular lesion somewhere and thereby having acquired a more or less specific resistance to tuberculosis. This state of resistance being necessary to positive reaction when tuberculin is used in any of the tests, it may be argued that a reaction obtained in one suffering from lung trouble does not establish a clear relationship between the process in the lung and the tubercular reaction. However, the syndrome of pulmonary physical symptoms, the fever and pulse symptoms, frequently combined with the decided gastric disturbances, and a positive reaction to tuberculin would seem to make rationally clear the diagnosis of tuberculosis of the lungs. In most of the instances the number of tubercle bacilli in the sputum was, in itself, conclusive.

Finding a large number of sufferers from tuberculosis chiefly among the miners, the question naturally arises, "Why does this state of affairs exist?" These men, inured to hard work, usually well muscled, and certainly above the average, physically speaking, ought to be freer from a tubercular disease than the majority of other classes in the community. Yet such in our city is not the case.

For the development of tuberculosis, three things are necessary. First the infectious agent; secondly a susceptible individual; thirdly some condition or conditions which act as assisting agents to the implantation of the infection.

In discussing the first requisite, that is the infectious agent, I would call attention to those conditions which are necessarily found in the mines. In the first place the air is moist; in the second place there is a considerable degree of heat; and in the third an absolute lack of the actinic sun rays, which are the potent sterilizing agents for the destruction of these micro-organisms. This heat and moisture with protection from the sun allows the organism or its spore to survive for many months, even years.

As the men are confined for hours at a time in these narrow passageways underground, where explosions and digging disseminate the organism through the air and where drafts carry it from point to point, it is easily seen how these men are subjected to a possible inoculation. I find, on making inquiry, it is a common habit to expectorate freely around where they are working and also to defecate in the drifts without coming to

the surface where proper arrangements may carry away the faecal matter. The faecae, as is well known, carries a large number of tubercle bacilli in those suffering from pulmonary tuberculosis. With this expectoration and by means of the faecae, it is easily seen how the tubercular bacilli are disseminated throughout the underground workings.

As to the second condition, that of predisposition, it is supposed that all people have more or less susceptibility for tubercle inoculation. In many, the process proceeds but a short way when it is overcome and leaves but a trace of its former residence in the body. When, however, the inoculation occurs so repeatedly through this constant exposure to the organism, it is easily understood how tuberculosis may gain such a firm hold that the individual is no longer able to throw it off.

The third condition, the agents which are active factors in bringing about the diminished resistance on the part of the individual and increases the susceptibility, must also be considered. First, the daily descent and ascent through some hundreds of feet, often rapidly, produces more or less disturbance in the pulmonary circulation. Secondly, working in an intense heat produces a certain degree of exhaustion of the vaso-motor apparatus and this coupled with the desire to take advantage of drafts to cool off, necessarily leads to lung congestion. I am told that many of the miners are in the habit of lying down for an hour or more in the drafts where they can cool off before coming to the surface. The third agent which evidently plays a part is the presence of dust and gas in the mine which irritates the pulmonary passages. This irritation leads to the characteristic lung fibrosis which has given to the affection the title "Miner's Consumption." It was thought for a long time that the lung lesion was purely a febrile one and had nothing to do with tuberculosis itself.

The fourth cause for trouble is the chilling to which the miners are exposed when they come up from underground and have to go from the cage to the dressing room. During many months of the year the air above ground is quite chilly and dry, and they are subjected to a temperature change which necessarily leads to pulmonary congestion.

From many I have understood that the air pumped through the mines, sent by forced pressure, is deleterious to those who

breathe it or who get in the draft caused by it. This particular agent I cannot feel is essentially harmful, in fact I believe it to be conducive to health rather than disease.

With these factors, then, which we have just enumerated, it is easily seen why those who are in the habit of working in the mines become the victims of tuberculosis.

Out of the mines there is still another condition which must not be overlooked. These men are not fully aware of the infectious quality of tuberculosis, and sleep, eat and live together, thereby causing tuberculosis to be disseminated among their number. More than this, I find that the families of the consumptive miners are themselves becoming tuberculous, and even houses which are not properly renovated as a rule become a source of infection to those who are in no wise connected with the mines.

In this country of pure air and sunshine, where the breezes blow, and conditions exist which are typically antagonistic to the spread of tuberculosis, it seems almost a crime to allow this state of affairs to go on, when by a campaign of education it could be rectified. If the miner only knew that his tuberculous companion is a source of vital danger, and if he could only fully appreciate the significance of working underground with him, I think a long step will have been taken toward the elimination of this disease from our community. Just what measure is best to recommend at the present moment when so many bread-earners who have tuberculosis must make their living underground, is a difficult matter to decide. Certainly some steps should be taken, possibly a committee appointed to thoroughly canvass the situation and draft regulations.

It is with this knowledge of what exists and with the hope of awakening some effort to stop the spread of this disease, that I present this paper.

COMMUNICABLE DISEASES REPORTED FOR THE MONTH OF MAY, 1909.

SMALLPOX—Cases of Smallpox were reported as follows: Dawson 5; Deer Lodge 1 (in Anaconda); Flathead 4; Gallatin 4; Jefferson 2; Lewis and Clark 1 (in Helena, imported); Missoula 1 (in Missoula City); Park 12 (6 in Livingston); Sanders 1; Silver Bow 16 (all in Butte); Teton 1; Valley 1; Yellowstone 1. Total, 50. Total last month, 65. Total last May, 68.

DIPHTHERIA—Cases of Diphtheria were reported as follows: Carbon 1; Cascade 11 (all in Great Falls); Chouteau 2; Custer 1; Deer Lodge 1 (in Anaconda); Fergus 2; Flathead 11; Jefferson 3; Lewis and Clark 8 (5 in Helena); Meagher 2; Missoula 5 (all in Missoula City); Park 1 (in Livingston); Powell 1; Ravalli 1; Rosebud 1; Silver Bow 12 (all in Butte); Valley 6; Yellowstone 3 (2 in Billings). Total, 72. Total last month, 72. Total last May, 100.

SCARLATINA—Cases of Scarlet Fever were reported as follows: Broadwater 17; Carbon 26; Cascade 48; Chouteau 4; Dawson 1; Deer Lodge 17 (all in Anaconda); Fergus 1; Flathead 5 (4 in Kalispell); Gallatin 24 (17 in Bozeman); Granite 2; Jefferson 5; Lewis and Clark 18 (13 in Helena); Madison 5; Missoula 33 (20 in Missoula City); Park 5 (4 in Livingston); Powell 1; Ravalli 2; Sanders 1; Silver Bow 25 (all in Butte); Teton 3; Valley 1; Yellowstone 12 (all in Billings). Total, 256. Total last month, 224. Total last May, 158.

MEASLES—Cases of Measles were reported as follows: Carbon 28; Cascade 4 (all in Great Falls); Chouteau 10; Dawson 1; Fergus 10; Flathead 1 (in Kalispell); Lewis and Clark 5 (all in Helena); Missoula 5 (all in Missoula City); Park 10 (4 in Livingston); Rosebud 8; Sweet Grass 2; Teton 1; Yellowstone 27 (7 in Billings). Total, 112. Total last month, 214. Total last May, 73.

TYPHOID FEVER—Cases of Typhoid Fever were reported as follows: Carbon 2; Dawson 1; Flathead 2; Lewis and Clark 1 (in Helena); Silver Bow 11 (all in Butte); Yellowstone 1 (in Billings). Total, 18. Total last month, 3. Total last May, 6.

MORTALITY

Deaths Reported to the State Board of Health for the Month of
May, 1909, Arranged According to Counties,

	Spotted Fever...	Tuberculosis.....	Diphtheria.	Scarlet Fever.....	Measles.....	Typhoid Fever....	Meningitis.....	Whooping-Cough..	Pneumonia.....	Nephritis.....	Organic Heart Disease	Malignant Tumors	Acute Intestinal Diseases.	Violence.....	Suicide.....	Alcoholism.....	All other Causes..	Totals.....
Beaverhead....										2					1		4	7
Broadwater....																	1	1
Carbon.....		1	1	1		1	2		3	1		1					10	21
Cascade.....				1		1	1		6	1	1	1	1			1	9	30
Chouteau....			1						1	1				1			2	6
Custer.....										1							1	2
Dawson.....											1			1			7	9
Deer Lodge...		1							1			1		3		1	10	17
Fergus.....					1	1			3								4	9
Flathead....			1						3			1					11	16
Gallatin.....							1		3					1			10	15
Granite.....														5			1	6
Jefferson.....		1										1	1	1			1	5
Lewis & Clark..		2	3						2	3							10	20
Madison.....		1							2	1		1	2	1	1		4	13
Meagher.....														1			3	4
Missoula.....	5	3		5					5			1	1	5		1	14	40
Park.....		1		1					1		1	1	1	1		1	3	11
Powell.....		1							2					1			4	8
Ravalli.....	3	1							2							1	4	11
Rosebud.....									3									3
Sanders.....									1								1	2
Silver Bow....		10	2	3		3	4		11	1	1	5	3	8	3	1	40	95
Sweet Grass...									1					1			3	5
Teton.....			1											1			2	4
Valley.....		2										1					1	4
Yellowstone...			1				1		3	1	1	1	1	4	1		6	20
Totals.....	8	24	10	11	1	6	9		53	12	5	15	10	42	6	6	166	384

Deaths per 100,000, 137.1

Annual Death rate per 1,000; 16.45

Deaths from principal causes in cities of 5,000 or more inhabitants

Anaconda.									1			1		3		1	4	10
Billings.....			1				1		3	1	1	1		3			3	14
Bozeman.....							1		1					1			3	6
Butte.....		4	2	2		3	3		7	1	1	2	2	3	3	1	26	60
Great Falls ..				1		1	1		3	1	1			5		1	6	20
Helena.....		1	1						2	3							9	16
Kalispell.....			1						1			1					7	10
Livingston....		1									1	1	1	1			1	6
Missoula.....	5	3		4					4			1	1	3		1	11	33

BIRTHS

Births Reported to the State Board of Health for May, 1909
and comparative birth and death rate in State.

	Males	Females	Totals	Deaths	Excess of Births	Excess of Deaths		Males	Females	Totals	Deaths	Excess of Births	Excess of Deaths
Beaverhead.....	8	8	16	7	9	....	Meagher.....	1	1	2	4	....	2
Broadwater.....	3	2	5	1	4	....	Missoula.....	16	9	25	40	....	15
Carbon.....	19	10	29	21	8	....	Park.....	14	13	27	11	16	....
Cascade.....	22	24	46	30	16	....	Powell.....	2	3	5	8	....	3
Choteau.....	7	6	13	6	7	....	Ravalli.....	14	8	22	11	11	....
Custer.....	8	6	14	2	12	....	Rosebud.....	4	2	6	3	3	....
Dawson.....	8	8	16	9	7	....	Sanders.....	2	....	2	2	....	....
Deer Lodge.....	15	6	21	17	4	....	Silver Bow.....	32	41	73	95	....	22
Fergus.....	15	9	24	9	15	....	Sweetgrass.....	6	2	8	5	3	....
Flathead.....	24	14	38	16	22	....	Teton.....	2	....	2	4	....	2
Gallatin.....	6	8	14	15	....	1	Valley.....	5	6	11	4	7	....
Granite.....	1	1	2	6	....	4	Yellowstone.....	12	21	33	20	13	....
Jefferson.....	5	4	9	5	4	....						
Lewis and Clark.....	19	13	32	20	12	....	Totals.....	272	228	500	384	116	....
Madison.....	2	3	5	13	....	8							

Births in Cities of 5,000 or more inhabitants.

Anaconda.....	15	6	21	10	11	....	Great Falls.....	13	15	28	20	8	....
Billings.....	4	12	16	14	2	....	Helena.....	16	12	28	16	12	....
Bozeman.....	4	5	9	6	3	....	Kalispell.....	11	7	18	10	8	....
Butte.....	24	31	55	60	....	5	Livingston.....	10	9	19	6	13	....
							Missoula.....	14	9	23	33	....	10